

REMARKS

Claims 1-7 and 23-34 are pending. By this Amendment, claims 1, 2, 7, 23, 29, 31 and 33 are amended and new claims 35-37 are added.

Claim 1 has been amended to recite that the base plate has "a proof stress of not higher than 95 (MPa)," that the ceramic substrate board is "formed of a planar plate," and that "one surface of the ceramic substrate board is bonded directly to the base plate without any intervening material in such a manner that the aluminum or aluminum alloy is molten, contacted with the ceramic substrate board, and cooled" in combination with the other elements of the claim.

Claim 7 has been amended to recite that the base plate has "a proof stress of not higher than 95 (MPa)" and that "one surface of the ceramic substrate board is bonded directly to the base plate without any intervening material in such a manner that the aluminum or aluminum alloy is molten, contacted with the ceramic substrate board, and cooled" in combination with the other elements of the claim.

Claim 23 has been amended to recite that the base plate has "a proof stress of not higher than 95 (MPa)," that the ceramic substrate board is "formed of a planar plate," and that "one surface of the ceramic substrate board is bonded directly to the base plate without any intervening material in such a manner that the aluminum or aluminum alloy is molten, contacted with the ceramic substrate board, and cooled" in combination with the other elements of the claim.

Minor amendments have also been made to claims 2, 29, 31, and 33. Support for the amendments to the claims can be found throughout the application as filed. Therefore, no new matter has been added.

New claims 35-37 have been added. Support for new claims 35-37 can be found in the application as filed in Examples 1-10 on pages 9-16, for example. Therefore, no new matter has been added.

### **Claim Objections**

Claims 23 and 24 stand objected to for the phrase "a ceramic substrate of planar plate." Claim 23 has been amended to recite "a ceramic substrate board formed of a planar plate." Claim 24 depends from claim 23. Therefore, Applicants respectfully request that the objection to claims 23 and 24 be withdrawn.

### **Claim Rejections**

Claims 1, 2, 4-7, 23, 24, 26, 27, and 29-34 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 4,531,044 to Chang (hereinafter "Chang") in view of U.S. Patent No. 4,284,437 to Baba et al. (hereinafter "Baba") and further in view of U.S. Patent No. 5,650,662 to Edwards et al. (hereinafter "Edwards"). Claims 3 and 25 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Chang, Baba, Edwards, and further in view of U.S. Patent No. 6,033,787 to Nagase et al. (hereinafter "Nagase"). Claim 28 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Chang, Baba, Edwards, and Applicants' admitted prior art (FIG. 5 of the application as filed). Insofar as the rejections apply to the amended claims, the rejections are respectfully traversed.

Applicants again submit that a *prima facie* case of obviousness has not been established with respect to the combination of Chang, Baba, and Edwards suggested in the Office Action. There is no motivation to combine the cited references as suggested, and there is no reasonable expectation of success in such a combination. Further, even if combined as suggested, the cited references would not teach or suggest each and every limitation of the claims.

There is no teaching or suggestion to combine Baba with either Chang or Edwards. Baba is directed to a process for preparing hard tempered aluminum alloy sheet. The process of Baba includes *hot rolling* an ingot of aluminum alloy, intermediate *annealing* the hot rolled alloy, and final *cold rolling* the annealed alloy (Abstract; emphasis added). Baba includes no mention of laser soldering, ceramic substrates, or electrical leads as taught by Chang, but rather teaches use of the sheets for preparing “deeply drawn cups” (Baba, col. 5, lines 43-49; see also col. 1, lines 12-16, discussing the suitability of alloys “for cans for beverages, food and other goods”). Applicants respectfully submit that Baba and Chang are non-analogous at least to the extent that one skilled in the art of circuit boards would not be motivated to look to Baba, and no such motivation can be found in any of Baba, Chang, or Edwards.

Further, there is no reasonable expectation of success in the suggested combination of Baba, Chang, and Edwards. As previously mentioned, Baba teaches a process that includes hot rolling an ingot of aluminum alloy, intermediate annealing the hot rolled alloy, and final cold rolling the annealed alloy (Abstract). Such a process would be incompatible with a ceramic substrate and the teachings of Chang and Edwards. The alloy sheet of Baba could not be directly bonded to either the ceramic substrate board of Chang or the substrate of Edwards if preformed, and the alloy sheet of Baba could not be formed if the alloy was directly bonded to a ceramic prior to hot rolling, annealing, and cold rolling, as the ceramic is brittle and would crack or break under the pressures of Baba’s process. There is no teaching or suggestion in any of Baba, Chang, or Edwards to provide an expectation of success to the contrary.

Even if combined as suggested, the cited references fail to teach each and every limitation of the claims. Amended claim 1 now recites that “one surface of the ceramic substrate board is bonded directly to the base plate without any intervening material in such a manner that the aluminum or aluminum alloy is molten, contacted with the ceramic substrate board, and

cooled" in combination with the other elements of the claim. This is neither taught nor suggested by the cited references.

As mentioned in the Office Action, "Chang and Baba do not show the ceramic substrate board bonded directly to the base plate without any intervening material." (Office Action mailed June 19, 2006, at page 4.) Further, Chang is directed to methods of soldering and does not even mention that the aluminum or aluminum alloy is molten, contacted with the ceramic substrate board, and cooled, as recited in amended claim 1. Baba, as discussed above, is directed to a process for preparing hard tempered aluminum alloy sheet. The process of Baba includes *hot rolling* an ingot of aluminum alloy, intermediate *annealing* the hot rolled alloy, and final *cold rolling* the annealed alloy (Abstract; emphasis added). There is also no mention in Baba that the aluminum or aluminum alloy is molten, contacted with the ceramic substrate board, and cooled, as recited in amended claim 1. Edwards also does not teach or suggest that "one surface of the ceramic substrate board is bonded directly to the base plate without any intervening material in such a manner that the aluminum or aluminum alloy is molten, contacted with the ceramic substrate board, and cooled," as recited in amended claim 1.

Amended claim 1 also now recites that the base plate has "a proof stress of not higher than 95 (MPa)" in combination with the other elements of the claim. This is also neither taught nor suggested by any of Chang, Baba, and Edwards. In Baba, for example, the lowest proof stress is 30.6 kg/mm<sup>2</sup> (corresponding to a proof stress of about 299 MPa) as shown in Tables 2, 4, and 6.

Although not cited with respect to claim 1, none of the remaining references teach or suggest the metal-ceramic circuit board of amended claim 1. Therefore, claim 1 is allowable. Claims 2-6, 29, and 35 depend from claim 1 and are therefore also allowable. The rejections of claims 2-6 and 25 are traversed but not expressly argued in view of the allowability of the underlying base claim.

Similar to claim 1, amended claim 7 now recites a power module comprising a base plate "having a proof stress of not higher than 95 (MPa)," and further "wherein one surface of the ceramic substrate board is bonded directly to the base plate without any intervening material in such a manner that the aluminum or aluminum alloy is molten, contacted with the ceramic substrate board, and cooled" in combination with the other elements of the claim. At least for reasons similar to those set forth above with respect to amended claim 1, claim 7 is also allowable. Claims 31, 32, and 36 depend from claim 7 and are therefore also now allowable. The rejections of claims 31 and 32 are traversed but not expressly argued in view of the allowability of the underlying base claim.

Amended claim 23 now recites a metal-ceramic circuit board comprising a base plate "having a proof stress of not higher than 95 (MPa)," and further "wherein one surface of the ceramic substrate board is bonded directly to the base plate in such a manner that the aluminum or aluminum alloy is molten, contacted with the ceramic substrate board, and cooled" in combination with the other elements of the claim. At least for reasons similar to those set forth above with respect to amended claims 1 and 7, claim 23 is also allowable. Claims 24-28, 33, 34, and 37 depend from claim 7 and are therefore also now allowable. The rejections of claims 24-28, 33, and 34 are traversed but not expressly argued in view of the allowability of the underlying base claim.

#### **Supplemental Information Disclosure Statement**

A Supplemental Information Disclosure Statement (IDS) is submitted herewith to correct a typographical error in a previous Supplemental IDS filed on January 7, 2005. In the previous Supplemental IDS, a reference listed as "EP 11226717" should instead have been identified as "JP 11226717." Applicants note that a copy of the proper Japanese reference (with an English language abstract) was submitted in the previous Supplemental IDS. Applicants' attorney called

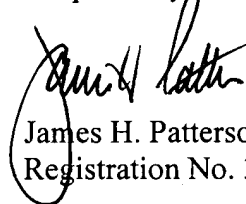
the Examiner on May 22, 2006, to notify him of this typographical error but nevertheless are filing a Supplemental IDS concurrent with this Amendment to correct the file.

**Conclusion**

In view of the foregoing, it is submitted that this application is in condition for allowance. Favorable consideration and prompt allowance of the application are respectfully requested.

The Examiner is invited to telephone the undersigned if the Examiner believes it would be useful to advance prosecution.

Respectfully submitted,

  
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